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THE SANTA MONICA DIATOMACEOUS DEPOSIT WITH LIST OF REFERENCES TO FIGURES OF SPECIES.*

BY E. A. SCHULTZE AND C. HENRY KAIN.

Probably no fossil diatomaceous material ever excited greater interest than that from Santa Monica, California. A paper upon the deposit by Mr. Charles Stodder was read before the San Francisco Microscopical Society, December 5, 1878. At that meeting, Mr. Thomas P. Woodward, who found the original piece of material, stated that he discovered it in the tidal refuse left by the waves at high water mark. The locality was about two miles south of a lagoon situated several miles southeast of Santa Monica. He also stated that there were no evidences of any other diatomaceous earth in the vicinity.

A few years since, Mr. F. H. Dunning, of Battle Creek, Michigan, discovered that the true source of the material was at Redondo Beach, some twenty-five or thirty miles south of Santa Monica. At this place the material occurs abundantly in a bluff situated on the beach, and pieces of it which have been broken off by the action of the waves can be picked up at low tide, at the foot of the cliff.

Mr. Silas L. Schumo, of Philadelphia, who has recently visited the locality, states that the diatom cliffs begin about ten miles south of Redondo Beach and extend southward for several miles, at least as far as San Pedro. There is some difficulty in getting at the material, however, as the foot of the cliff is only accessible at low tide. The deposit is so

* *Bulletin of the Torrey Botanical Club.* XXIV. 496 (*November*, 1897).

interesting that it is to be hoped microscopists on the Pacific coast will explore it more thoroughly.

Those who have made a study of the matter are aware of the extreme difficulty of tracing out the species through the literature of the Diatomaceae, and will doubtless find of great service the following list of references to the figures of species contained in the famous deposit:

Actinoptychus	*splendens*	Ralfs. V. H., 119, f. 1, 2, 4.
"	*vulgaris*	Schum. V. H., 121, f. 5, 6; var. *Monicae*, 121, f. 9.
"	*undulatus*	Ehr. Atlas, 91, f. 5; *Atlas, 132, f. 16.*
"	*glabratus*	Grun. Atlas, 154, f. 2, 3, 4; V. H., 120, f. 6.
"	*spinifer*	Grun. Atlas, 153, f. 23.
"	*Mölleri*	Grun. *Atlas, 132, f. 14.*
"	*hispidus*	Grun. *V. H., 123, f. 2.*
"	*Stella*	A. S. *Atlas, 90, f. 1, 2.*
"	*Bismarckii*	A. S. Atlas, 91, f. 4.
"	*Gründleri*	A. S. Atlas, 100, f. 3, 4.
"	*Asiaticus*	Temp. & Br. *Atlas, 156, f. 10; Diatoms of Japan, p. 11, 3, f. 9.*
"	*laevigatus*	Grun. *V. H., 122, f. 7; Atlas, 132, f. 15.*
"	*nitidus*	Grev. *Atlas, 1, f. 7.*
"	*Clevei*	A. S. *Atlas, 91, f. 1.*
Aulacodiscus	*Comberi*	Arn. *Atlas, 36, f. 11; 103, f. 5.*
"	*angulatus*	Grev. *Atlas, 34, f. 7, 8; 103, f. 2; 105, f. 7, 8.*
"	*convexus*	Gr. & St. *J. Q. C., Aug., '87, 12, f. 32.*
"	*margaritaceus*	Ralfs. *Atlas, 37, f. 1–8; 92, f. 12; 103, f. 6–9; 105, f. 1.*
"	*amoenus*	Grev. *Atlas, 34, f. 6; 40, f. 13; 134, f. 7; var. sparsi-radiata, 133, f. 4–6*
"	*pulcher*	Norm. *Pritch, 8, f. 28.*
"	*Oreganus*	Bail. Atlas, 107, f. 7.
"	*Kittoni*	Arn. *Atlas, 36, f. 5–7.*
"	*Huttonii*	Gr. & St. *Atlas, 124, f. 6; 146, f. 8; J. Q. C., Aug., '87, 12, f. 31.*
"	*Crux*	Ehr. *Atlas, 105, f. 5; 124, f. 1.*
"	*Rattrayi*	Gr. & St. *J. Q. C., Aug., '87, 11, f. 29.*
Auliscus	*speciosus*	A. S. Atlas, 108, f. 3; 80, f. 5.
"	*punctatus*	Bail. Atlas, 89, f. 14–17.
"	*Hardmanianus*	Grev. Atlas, 67, f. 1; 89, f. 4; var. Atlas, 108, f. 1.
"	*Biddulphia*	Kitt. Atlas, 67, f. 3.; var. Atlas, 89, f. 2.

Auliscus	*Stockhardtii* (*A. racemosus* Ralfs)	Jan. Atlas, 67, f. 6.
"	*pruinosus*	Bailey. *Atlas, 31, f. 6; 108, f. 10;* var. *subreticulata* Grun., Atlas, 89, f. 5, 6.
"	*ovalis*	Arn. *Atlas, 30, f. 16, 17.*
"	*mirabilis*	Grev. Atlas, 89, f. 13.
"	*confluens*	Grun. *Atlas, 31, f. 16; 32, f. 6–8.*
"	*caelatus*	Bail. *Atlas, 32, f. 14, 15.*
"	*sculptus*	Ralfs. *Atlas, 30, f. 8; 32, f. 21, 22; V. H., 117, f. 1.*
Actinocyclus	*subocellatus*	Rattr.
"	*radians*	Rattr.
"	*incertus*	Grun. V. H., 125, f. 4.
"	*Ehrenbergii*	Ralfs. V. H., 125, f. 1; var. *intermedia* Grun. V. H., 124, f. 5.
"	*Ralfsii*	Sm. *V. H., 123, f. 6;* var. *Monicae*, Grun. V. H., 124, f. 3; var. *Janischii* Schum. V. H., 125, f. 1.
"	*fasciculatus*	Cast. *Cast, 4, f. 8.*
"	*subtilis*	Ralfs. *V. H., 124, f. 7.*
Arachnoidiscus	*Indicus*	Ehr. *Atlas, 68, f. 6; vars. Atlas, 68, f. 7–10; 73, f. 2.*
"	*ornatus*	Ehr. *Atlas, 73, f. 4–6; vars. Atlas, 73, f. 7–10.*
"	*Ehrenbergii*	Bail. *Atlas, 68, f. 1; vars. 68, f. 2, 3, 4.*
"	*Grevilleanus*	Hardm. *Atlas, 68, f. 5; 73, f. 3.*
Amphora	*crassa*	Greg. *vars. Atlas, 39, f. 30, 31; 28, f. 12; Leus, p. 75, pl. 2, f. 5.*
Asterolampra	*rotula*	Grev. *T. M. S., 1860, p. 120, 3, f. 5;* (*Moebius, 32, f. 5*).
"	*Brebissonii*	Grev. *T. M. S., 1860, p. 114, 3, f. 9;* (*Moebius, 32, f. 9*).
"	*Darwinii*	Grev. *T. M. S., 1860, p. 116, 4, f. 12, 13;* (*Moebius, 33, f. 12, 13*).
"	*variabilis*	Grev. *T. M. S., 1860, 111, 3, f. 68;* (*Moebius, 32, f. 6–8*).
"	*Humboldtii*	Ehr.
"	*Brookei*	Grev. *T. M. S., 1860, p. 119, 4, f. 16;* (*Moebius, 33, f. 18*).
Amphitetras	*Graeffeana*	Witt. *Atlas, 79, f. 1, 9.*
Biddulphia	*multicornis*	Grun. *V. H., 102, f. 7;* var. Atlas, 173, f. 13, 14.
"	*pulchella*	Gray. *V. H., 97, f. 1–3; Atlas, 118, f. 26–32; 120, f. 22; 121, f. 1, 2.*
"	*Tuomeyi*	Bail. Atlas, 119, f. 15.
"	*capucina*	A. S. *Atlas, 113, f. 13, 14.*

Biddulphia	*polyacantha*	Brun.
"	*aurita*	Breb. *V. H., 98, f. 4–9;* Atlas, *120, f. 5–8; 122, f. 1–9; 122, f. 28.*
"	*longispina*	Grun. V. H., 102, f. 6.
"	*tridentata*	Ehr. Deby, p. 41, pl. 3, f. 21.
"	*Grundlerii*	A. S. *Atlas, 118, f. 22–24.*
Campylodiscus	*adornatus*	A. S. *Atlas, 51, f. 5; 52. f. 3.*
"	*Coronilla*	Brun. Deby, p. 42, pl. xiv., f. 69; also, pl. xiii., f. 66.
"	*concinnus*	Grev. *Atlas, 18, f. 16, 17; 53, f. 9.*
"	*Rabenhorstianus*	Jan. *Atlas, 53, f. 12, 14.*
"	*imperialis*	Grev. *Atlas, 17, f. 20; 15, f. 11; 52, f. 7; 53, f. 6, 7.*
"	*bimarginatus*	A. S. *Atlas, 16, f. 7; 18, f. 15–17.*
"	*Californicus*	(Grove) Deby. Deby, 42, pl. xiv., f. 70.
"	*Pfitzeri*	A. S. *Atlas, 17, f. 5, 6.*
"	*ecclesianus*	Grev. *Atlas, 16, f. 5, 6, 8–11.*
"	*biangulatus*	Grev. *Atlas, 14, f. 18–22.*
Campyloneis	*Grevillei*	A. S. *V. H., p. 134, 28, f. 10, 12.*
Coscinodiscus	*elegans*	Grev. *Atlas, 58, f. 7.*
"	*lineatus*	Ehr. *V. H., 131, f. 3; Atlas, 114, f. 13.*
"	*curvatulus*	Grun. *Atlas, 57, f. 30, 33;* var. *latius-striata,* Atlas, 57, f. 34.
"	*obscurus*	A. S. *Atlas, 61, f. 16–18; V. H., 129, f. 4.*
"	*debilis*	Grove. *Atlas, 163, f. 4.*
"	*Asteromphalus*	Ehr. Atlas, 113, f. 23; var. *eximia* (Rattray); Atlas, 63, f. 12.
"	*Odontodiscus*	Grun. *Grun,* Diat. of Franz Joseph Land *1884, p. 29, 3, f. 23.*
"	*Gigas*	Ehr. *Atlas, 64, f. 1.*
"	*robustus*	Grev. *Atlas, 62, f. 5, 6, 16, 17.*
"	*apiculatus*	Ehr. *Atlas, 64, f. 5–10;* var. *Monicae* (Rattray), Atlas, 63, f. 10.
"	*pilosus*	A. S. Atlas, 148, f. 8.
"	*polyacanthus*	Grun. *Cleve, 1880, 7, f. 127.*
"	*micans*	A. S. *Atlas, 139, f. 213.*
"	*excentricus*	Ehr. *Atlas, 58, f. 49; V. H., 130, f. 4, 7, 8.*
"	*luctuosus*	Grove. *Atlas, 148, f. 3.*
"	*radiatus*	Ehr. *Atlas, 113, f. 8.*
"	*concavus*	Ehr. *Atlas, 59, f. 16.*
"	*Diorama*	A. S. Atlas, 64, f. 2.
"	*borealis*	Bail. Atlas, 63, f. 11.
"	*tenuis*	Grun.

Coscinodiscus	*crassus*	Bail. *Atlas, 61, f. 19.*
Cocconeis	*cruciata*	Pant. *Pant. Vol. 1, 16, f. 148.*
"	*formosa*	Brun. *Atlas, 193, f. 42–47.*
"	*voluta*	Brun. Var. *singularis* A. S. ; Atlas, 196, f. 25, 26 ; var. 196, f. 19.
"	*Oculus-Cati*	Brun. Atlas, 198, f. 29 ; *Atlas, 198, f. 22, 23.*
"	*costata*	Greg. *V. H., 30, f. 11–17 ; Atlas, 189, f. 6, 7.*
"	*dirupta*	Greg. *V. H., 29, f. 13–15 ; Atlas, 197, f. 1, 31.*
"	*regalis*	Grev. *V. H., 28, f. 13, 14 ; var. 8, 9 ; M. J., 1889, p. 156, 7, f. 1=Moebius 21, f. 1.*
"	*pseudo-marginata*	Greg. *Atlas, 194, f. 8 ; 196, f. 5–8 ; V. H., 29, f. 20, 21.*
"	*interrupta*	Grun. *Atlas, 194, f. 17 ; V. H., 30, f. 3, 4.*
"	*cyclophora*, var. *Californica*	Brun. *V. H., 30, f. 24, 25 ; var. Atlas, 198, f. 1–3.*
"	*nitida*	Greg. *G. D. C., p. 20–1, f. 26 ; V. H., 36, f. 33.*
Cerataulus	*turgidus*	Ehr. *V. H., 104, f. 1, 2 ; Atlas, 116, f. 1–3 ; var. Atlas, 115, f. 12–14.*
"	*Hungaricus*	Pant. *Pant. Vol. II., 26, f. 375 ; (a variety of C. Thumii).*
"	*Kinkeri*	A. S. Atlas, 191, f. 37.
Climacosphenia		
Craspedodiscus	*coscinodiscus*	*Atlas, 66, f. 3, 4.*
Eupodiscus	*argus*	Ehr. *V. H., 117, f. 3–6 ; Atlas, 92, f. 7–11.*
"	*oculatus*	Grev. *Atlas, 117, f. 9.*
Eupleuria		
Euodia	*Janischii*	Grun. V. H., 127, f. 1–4.
"	*gibba*	Bail. *Prit. 852–8, f. 22 (= Hemidiscus cuneiformis) ; T. M. S., 1860, p. 42, 2, f. 3, 4 (= Moebius, 31, f. 3, 4).*
Endyctia	*oceanica*	Ehr. *Atlas, 65, f. 10, 13.*
Glyphodesmis	*Williamsonii*	W. Sm. *V. H., 36, f. 14.*
Grayia. Probably *Grayia Argonauta*		Grove and Brun. *Atlas, 172, f. 11.*
Goniothecium	*odontella*	Ehr. *V. H., 105. f. 11, 12 ; Moebius, 8, f. 47, 48.*
"	*obtusum*	Ehr. *Microgeologie, 18, f. 95.*
	Rogersii	Bail. *Mic. Dict. 42, f. 30 ; M. J., 1856, 7, f. 43, 46 ; (= Moebius, 8, f. 43, 46).*

Grammatophora	*artica*	Cl. *V. H., 53, bis f. 3.*
"	*Tabellaris*	Brun.
"	*stricta*	Ehr. *Witt. 1888, p. 16, 3, f. 7, 14; Jeremie, Hayti.*
"	*robusta*	Dippel. *Pant. Vol. I., 30, f. 312, 315, 316.*
"	*maxima*	Grun. *V. H., 53, bis f. 12.*
Gephyria	*gigantea*	Grev. *Grev. T. M. S., 1866, 122, 11, f. 7, 8; (Moebius, 74, f. 7, 8); Challenger, p. 42, 15, f. 10.*
Glyphodiscus	*stellatus*	Grev. *V. H., 118, f. 3. Atlas, 117, f. 11.*
Hyalodiscus		
Isthmia	*nervosa*	Kg. *Atlas, 136, f. 5; 135, f. 1–6.*
Lithodesmium	*minusculum*	Grun. *V. H., 116, f. 1–6.*
Melosira	*clavigera*	Grun. *V. H., 91, f. 1, 2; Atlas, 175, f. 21–24.*
"	*radiata*	Bright.
"	*Sol*	Kg. *V. H., 91, f. 7–9.*
"	*sulcata*	Kg. *Atlas, 178, f. 1–4; 7, 8, 9, 16, 17, 18, 19, 22, 23, 24; 25–36;* var.
Mastogonia	*polygona*	Ehr.
Navicula	*Taschenbergi*	A. S. Atlas, 174, f. 8, 9.
"	*sideralis.*	Brun. Atlas, 174, f. 3.
"	*pedalis*	Brun. Atlas, 174, f. 15.
"	*Apis*	Ehr. *Atlas, 12, f. 16–25; 69, f. 41, 43, 44; Donkin, p. 48, f. 3.*
"	*interrupta*	Kütz. *Atlas, 12, f. 10, 11; 12, f. 3–7, 8; 45, f. 72. V. H., 9, f. 7. Donkin, p. 47, 7, f. 2.*
"	*Eudoxia*	A. S. *Atlas, 8, f. 39, 40; 70, f. 71.*
"	*elliptica*	Kütz. *Atlas, 7, f. 27–32, 33, 34, 54, 55; V. H., p. 92, 10, f. 10.*
"	*aspera*	Ehr. *Atlas, 48, f. 2–6; var. 48, f. 14, 15.*
"	*pennata*	A. S. *Atlas, 48, f. 41–43.*
"	*praetexta*	Ehr. *Atlas, 129, f. 7; 3, f. 30–32–34; V. H., p. 92, 9, f. 13.*
"	*Angelorum*	*Cleve, Some new and little known Diatoms, p. 8, 2, f. 20.*
"	*Oswaldii*	Jan. *Atlas, 70, f. 46.*
"	*spectabilis*	Grev. *vars. Atlas, 2, f. 31; 3, f. 20, 21, 24; Grun, 1860, p. 533, 1, f. 11 (N. Grunowii, Atlas, 70, f. 73).*
"	*Lyra*	Ehr. *Atlas, 2, f. 24, 25, 32; 3, f. 11, 12; V. H., p. 93, 10, f. 1.*
"	*gelida*	Cl. *Diat. Franz Joseph Land., 1, f. 27, 28; Cleve., Vega ex., p. 473, 37, f. 42.*

Navicula	*Hennedyi*	Sm. *Atlas, 3, f. 18; V. H., p. 93, 9, f. 14.*
"	*clavata*	Greg. *Donkin, 2, f. 8; Greg., M. J., 1888, p. 46, 5, f. 17;* (*Moebius, pl. 10, f. 17*).
"	*Basilica*	Brun.
"	*Dirrhombus*	A. S. *Atlas, 11, f. 21, 22; 69, f. 9.*
"	*gemmata*	Grev. *Var. spectabilis, Atlas, 8, f. 38* (*N. Grunowii*)*; Grev, New species of Naviculae in Californian Guano, p. 30, 4, f. 7.*
"	*ornata*	A. S. *Atlas, 69, f. 5.*
"	*splendida*	Greg. *Atlas, 12, f. 31–35; 13, f. 31–34; 69, f. 22.*
"	*Crabro*	Ehr. Var. Atlas, 69, f. 2; *vars. Atlas, 69, f. 3, 4; V. H., 9, f. 1, 2; Atlas, 129, f. 17, 18.*
"	*robusta*	Grun. *Atlas, 50, f. 1, 2.*
"	*Californica*	Grev. *Vars. Atlas, 3, f. 15, 16, 19; 3, f. 6.*
"	*forcipata*	Grev. *Atlas, 70, f. 17; V. H., p. 94, 10, f. 3.*
Nitzschia	*Formica*	Hantzsch. *Diat. of East Indian Archipelago, p. 21, 2, f. 8.*
Orthoneis	*splendida*	Grun. *V. H., 28, f. 1, 2.*
Peponia	*Barbadensis*	Grev. *Atlas, 144, f. 48, 49.*
Porpeia	*quadrata*	Grev. V. H., 95, bis f. 15.
"	*quadriceps*	Bail. *Atlas, 142, f. 46–57;* (*Moebius, 68, f. 13*)*; T. M. S., 1865, p. 52, 6, f. 18, 19.*
"	*ornata*	Grev. *T. M. S., 1865, p. 53, 6, f. 21.*
Pantocsekia		
Podosira.		
Pleurosigma	*affine*	Grun. *V. H., p. 115, 18, f. 9.*
Pyxilla	*Americana*	Grun. V. H. 83, bis f. 3.
"	*dubia*	Grun. *V. H., 83, f. 7, 8.*
Plagiogramma	*pulchellum*	Grev. *M. J., 1859, p. 209, 10, f. 4, 6* (*= Moebius, 24, f. 4, 6*)*; Prit., p. 774, 4, f. 32.*
Raphoneis	*Rhombus*	Ehr. *M. J., 1854, 6, f. 10* (*= Moebius, 4, f. 10*)*; Microgeologie, 18, f. 84, 85; 33, 13, f. 15; 35, A. 11, f. 3.*
Rutilaria	*hexagona*	Grun. V. H., 105, f. 8; Atlas, 183, f. 17.
"	*longiformis*	Temp. & Br.*

* Brun & Tempère give *R. epsilon* var. *longicornis.* Atlas, 183, f. 16; *vars. 13, 14, 15.*

Rhabdonema	*Adriaticum*	Kg. *V. H., 166, 54, f. 11, 13.*
"	*Japonicum*	Temp. & Br. *p. 53, 1. f. 6; Diat. Japan.*
"	*valdelatum*	Temp. & Br. *p. 53, 1, f. 4; Diat. Japan.*
Stauroneis	*pulchella*	Sm.= *Nav. aspera, which see.*
Synedra	*superba*	Kg. *O'Meara, p. 199, 28, f. 9; S. B. D., 12, f. 102.*
"	*longissima*	Smith. *O'Meara, p. 307, 28, f. 27; S. B. D., p. 72, 12, f. 95.*
Stephanopyxis	*appendiculata*	Ehr. *Several varieties; Atlas, pl. 130.*
"	*rudis*	Grev. Atlas, 164, f. 9.
"	*Grunowii*	G. & St. *Atlas, 130, f. 1, 5.*
"	*Weissflogii*	A. S. *Atlas, 123, f. 2.*
"	*Corona*	Grun. Atlas, 123, f. 19, 20.
Stictodiscus	*Californicus*	Grev. *Atlas, 74, f. 4, 5; vars. pl. 74; pl. 147, f. 10.*
"	*nitidus*	G. & St. *Atlas, 131, f. 7, 8.*
"	*Kittonianus*	Grev. *Atlas, 74, f. 16, 18; 131, f. 4.*
Systephania	*Corona*	Ehr. *See Stephanopyxis corona.*
Skeletonema.		
Stephanogonia	*actinoptychus*	Ehr. *V. H., 83, ter f. 2, f. 4;* (= *Mastogonia actinoptychus.*)
Triceratium	*formosum*	Bright. *Atlas, 79, f. 2.*
"	*arcticum*	Bright. *Atlas, 79, f. 12, 13;* var. Californica, Grun., forma tetragona, Atlas, 81, f. 4; *var. Californica, Grun., Atlas, 79, f. 5, 6.*
"	*Montereyi*	Bright. Atlas, 94, f. 1, 2, 3.
"	*consimile*	Grun. V. H., 108, f. 2; *Atlas, 84, f. 13, 14.*
"	*quinquelobatum*	Grun. *Atlas, 79, f. 8.*
"	*parallelum*	Grev. *Atlas, 75, f. 3–5.*
"	*heteroporum*	Grun. V. H., 112, f. 2.
"	*punctatum*	Bright. *Atlas, 76, f. 19, 20; M. J., 1856, p. 275, 17, f. 18;* (*Moebius, 9, f. 18*).
"	*Browneanum*	Grev. *T. M. S., 1861, p. 72, 8, f. 16;* (*Moebius, 38, f. 16*).
"	*Brightwellii*	West. *T. M. S., 1860, p. 149, 7, f. 6; vars. V. H., pl. 114.* (*Moebius, 34, f. 6.*)
"	*inelegans*	Grev. Atlas. 81, f. 16.*
"	*elegans*	Grev. V. H., 109, f. 1; forma *pusilla*, V. H., 109, f. 3; *Atlas, 99, f. 10–13.*

*Varieties: V. H., 110, f. 2, var. *araeophora* Grun.; V. H., 110, f. 3 var. *microphora* Grun.; V. H., 110, f. 4, 5, var. *Yucatensis* Grun.

Triceratium	*favus*	Ehr. *Atlas, 126, f. 5–7; 82, f. 13, 14; V. H., 107, f. 1–4.*
"	*cellulosum*	Grev. *Atlas, 95, f. 28–32*
"	*trisulcum*	Bail. *Atlas, 78, f. 5–8; 112, f. 17, 18.*
"	*quadrangulare*	Grev. Atlas, 81, f. 3.
"	*antediluvianum*	Ehr. *V. H., 109, f. 4, 5.*
"	*subcornutum*	Grun. *Atlas, 99, f. 15–18.*
"	*constellatum*	Temp. & Br. *Diat. of Japan, p. 61, 6, f. 12.*
Xanthiopyxis	*umbonatus*	Grev. *T. M. S., 1866, 2, 1, f. 5;* (*Moebius, 70, f. 5*).

In addition to the preceding; which are on slides belonging to J. D. Möller and E. A. Schultze, the following species are figured as existing in the Santa Monica deposit:

Cosc. marginatus Ehr.	Atlas, 62, f. 5; 62, f. 7.
" " " var. *intermedia.*	" 62, f. 6.
" (*apiculatus* var.) Monicae Rattray	" 63, f. 10.
Navicula demta A. S.	" 69, f. 34.
Triceratium receptum A. S.	" 81, f. 10.
Auliscus Grunowii A. S.	" 89, f. 7; 30, f. 14.
" *textilis* A. S.	" 89, f. 9.
" *incertus* A. S.	" 89, f. 18.
Eupodiscus Californicus Grun., forma *bioculata.*	" 89, f. 20; V. H., 118, f. 7.
Triceratium validum Grun.	" 94, f. 5.
Actinoptychus Thumii A. S.	" 102, f. 8.
Aulacodiscus Kinkeri A. S.	" 106, f. 4, 5.
Auliscus intestinalis A. S.	" 108, f. 2.
Campylodiscus trapezoidalis Deby.	Deby, pl. xiv., f. 72.
Coscinodiscus oculus iridis Ehr.	Atlas, 113, f. 20.
" *floridulus.*	" 113, f. 16.
Stephanopyxis spinosissima Grun.	" 123, f. 18.
" ?	" 138, f. 14.
Cosc. incretus A. S.	" 139, f. 1.
Podosira variegata A. S.	" 140, f. 3.
Porpeia ?	" 142, f. 53–56, 57.
Stictodiscus ?	" 147, f. 8.
Pseudauliscus sp. ?	" 149, f. 10.
Triceratium quadrinotatum A. S.	" 152, f. 31.
Actinoptychus spinulosus A. S.	" 153, f. 24.
Auliscus albidus Brun.	" 171, f. 3, 4; 171, f. 5.
" var. *baccata* Brun.	
Chaetoceros Monicae Grun.	V. H., 82 bis f. 4.
" *Californicus* Grun.	" 82 bis f. 8.
Pterotheca (*Pyxilla?*) *subulata* Grun.	" 83 bis f. 6.

Stephanopyxis limbata Ehr.	V. H., 83 ter, f. 13, 14.
Zygoceros circinus Bail.	" 105, f. 13.
Tric. (*Odontella*) *Californicum* Grun.	" 108, f. 1.
Tric. (*Biddulphia*) *obliquum* Grun.	" 110, f. 11.
Actinoptychus? pulchellus Grun.	" 123, f. 5.
" *? alienus* Grun., var. *Californica* Grun.	" 125, f. 10.
Coscinodiscus impressus Grun.	" 132, f. 5.

KEY TO REFERENCES.

V. H.= Van Heurck's Diatoms of Belgium.
Atlas = Schmidt's Atlas der Diatomaceen-kunde.
J. Q. C.= Journal Quekett Club.
M. J.= Quarterly Journal of Micros. Science.
T. M. S.=Transactions of Royal Microscopical Society. London.
Pritch.= Pritchard's History of the Infusoria. London, 1861.
Cast.= Diatomaceae of the Challenger Expedition by Count Castracane, 1887.
Deby = Analysis of the genus Campylodiscus. Sir Julian Deby.
Pant.= Beitrage zur kentniss der fossilen Bacillarien Ungarns.
Microgeologie = Ehrenberg. 1854.
Mic. Dict.= Micrographic Dictionary.
Donkin = History of British Diatomaceae. H. S. Donkin.
O'Meara = Report on the Irish Diatomaceae. Rev. E. O'Meara.
Diatoms of Japan = Brun & Tempère.
S. B. D.= Synopsis of the British Diatomaceae. Rev. Wm. Smith.
Moebius = A reproduction of plates of diatoms, by B. Moebius, principally from the Transactions of the Royal Microscopical Society.

No attempt has been made to give a complete reference of species, but to give references preferably to such works as are generally easiest of access. It will be noticed that most of them are referred either to Schmidt's Diatom Atlas, or to Van Heurck's synopsis. The references in roman mention Santa Monica as the locality. The references in italic indicate other localities.

A NEW LABORATORY DISH.*

BY PROF. W. M. L. COPLIN, M.D., JEFFERSON MEDICAL COLLEGE.

In the laboratory of the College we use for routine work the paraffin method almost exclusively. The blocks of tissue are infiltrated in the usual manner, and the sections cut with the Ryder or Minot microtome. The student cuts his sections and fastens them on the slide by means of Olemacher's combined water albumen method, a combination, with certain improvements, of the methods of Gaule and Mayer. These are then placed in the drying oven at a temperature of 37° C. for from 12 to 24 hours, until all the water is evaporated, the paraffin and section having, during the evaporation of the water, straightened out perfectly. The slide is now gently warmed until the paraffin, which has a melting point of 45° C., begins to melt, when it is thrust into kerosene, which in 10 minutes completes the removal of the paraffin. The excess of kerosene is wiped off, the slide washed with a few drops of alcohol and then placed in a dish of alcohol; from this dish of alcohol the stain is proceeded with as usual. If the tissue has been hardened in corrosive sublimate it is necessary to carry the cemented section through diluted tincture of iodine to remove the mercurial salt; this is followed by washing in alcohol when the section is ready for staining. The stains are conveniently kept in large-mouthed bottles into which the slides are placed for staining, mordanting, dehydrating and clearing. It is usual for the student to take from 5 to 10 slides through the various solutions, at one time, and, in so doing, he not uncommonly scratches the section off of one slide by rubbing it against another. This difficulty arises, no matter whether the method of Gaule, Suchannek's modification of Gaule's method, Gulland's modification of Gaule's method, or, what is better, Heidenhain's water method, be used. Even using any of the collodion methods does not permit us to escape this danger. In order to overcome this,

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* *Science*. VI. 476 (September, 24, 1897).

the writer sought very carefully through the dishes which have been designed by various workers, but failed to find anything which was ideally available. True, Ranvier has designed a rack upon which a number of slides may be supported, but this is entirely too cumbersome for general laboratory use, and besides involves a large amount of fluid, which makes it an expensive luxury. With these points in view, I have devised a dish which is expected to overcome some of the above difficulties.

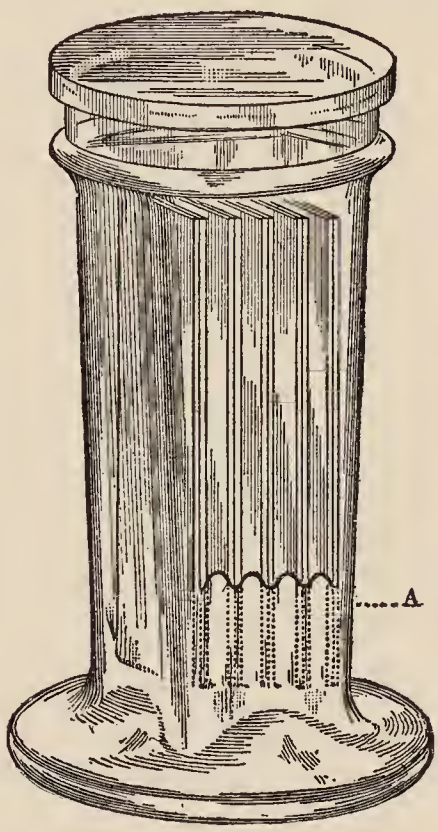

FIG. 1.

FIG. 2.

NEW LABORATORY DISH.

Fig. 1.—Perspective view. At A may be seen through the glass the four ribs of one side of the dish, and ten slides, standing on end in pairs firmly held in position in the grooves adjoining the ribs. Fig. 2.—Transverse section of the dish at A, showing a section of one pair of slides held in one pair of grooves.

The inside measurements of the dish are 3½ inches in height, 1 inch square at the bottom, 1⅜ inches square, 3 inches from the bottom, and 1¾ inches in diamater at the top, which is round and closed by means of a ground, grooved, Stender cover, which, of course, fits air-tight. In order to render the dish stable, the base is the broadest and heaviest part, measuring nearly 2½ inches in diameter. Extending upward from the bottom of the inside of the dish, on two opposite sides, are eight ribs, four on each side, forming

between them three grooves sufficiently wide to admit, in each groove, two slides of ordinary thickness. There can, also, be placed in the outside groove, between the outside ribs on each side, and the inside of the dish two slides. This gives the dish, for ordinary purposes, convenient and not crowded accommodation for eight slides standing on end; or, if the sections be not large and the slides not thick, four slides may be placed outside of the ribs, two on each side, back to back.

An ordinary Stender dish requires about 120 cc. of fluid to immerse a slide sufficiently to cover a section cemented to its centre. The above dish requires less than ⅓ of that amount to secure an equivalent degree of immersion. Of course, these dishes vary slightly in their capacity, as all pressed glassware does; such a variation, however, does not amount to more than from 10 to 15 cc.

Where, for reasons of economy, or otherwise, it may be desirable to close the top of the dish by means of a cork or rubber stopper, the expense may be materially reduced. When closed by means of a glass cover, as described above, and shown in the illustration, the cover and the dish will each bear the same number cut in glass, so that the student, working at his desk, may easily avoid mixing the covers, which would not only be detrimental by mixing incompatible fluids; but, as each lid can be ground to fit only the dish which accompanies it, exchanged lids will not fit tightly.

In order to facilitate cleaning and to avoid inaccessible corners, all the corners are rounded.

The advantages claimed for the dish are; (1) Convenience, in that a number of slides can be safely handled at one time. (2) Great economy in the reagents; not only is the amount used less than is required by the use of Stender dishes, but in case, as will not uncommonly happen with students, anything occurs which ruins the contained fluid the loss may be materially less. (3) Solidity; no other dish of the same height and the same capacity possesses the same solidity. (4) Contained fluids are prevented from evaporating by the tight-fitting top. This is not secured in the Naples dish.

THE VERTICAL ILLUMINATOR.*

BY WILLIAM FORGAN, F.R.M.S.

The vertical illuminator is an accessory which can only be considered as of value in the past history of the microscope. Professor Abbé has, however, revived the article in a somewhat different form. When Dr. Robertson asked me to contribute something to this meeting, I thought the experience I had had with it in the past would not be out of place. Matthew Arnold said, some time ago, in Queen Street Hall, that experience was the only true test and guide of everything we do. I, therefore, make no excuse for introducing some things of a personal nature in connection with this piece of apparatus. About five and twenty years ago I was the possessor of only three good objectives, the highest one being what was then considered a fine quarter, by Andrew Ross, of 90°. This glass had the double back then in use; and to compare it with one of the present day, it might be said to be a second rate one,—Mr. Wenham's introduction of the triple back and single front having entirely changed the character of these glasses. To these I afterwards added a fine $\frac{1}{8}$ water immersion by Powell & Lealand of 140° aperture, on their new formula.

I had, however, in these days a microscopical friend, who might be said to have been a micromaniac. He bought every new thing in connection with the microscope as soon as it was made. He had a Powell & Lealand No. 1 Stand, which alone cost him seventy guineas; a Crouch binocular of excellent workmanship, the binocular arrangement being a very fine one, the best I have ever seen. He had other two of Crouch's stands of simpler form and a Beck Educational Stand. Some of these instruments were furnished with achromatic illuminators of the most expensive description. His objectives comprised a complete set of the high-powers which were devised by Mr. Wenham; found afterwards to be good for direct

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* *Proc. Scottish Micros. Soc. II. 56 (1897).*

light, but useless for oblique illumination. Mr. Wenham endeavored in these glasses to correct single chromatic back and front lenses by an achromatic middle one. He had also a full set of Powell & Lealand's objectives, from their 3-inch up to their $\frac{1}{16}$ water immersion. These included no less than four $\frac{1}{8}$ths, three of them on their new formula, the last one purchased having a hyper-hemispherical front, now common in modern objectives. Besides these he had objectives by Wray, Swift and other makers.

I possessed by occasional purchases about 1,000 finely mounted slides, a large portion of which were diatoms, most of which I yet have; but his collection of slides could be counted by the thousand.

I mention these facts to show the wealth of material we were provided with.

For a period of between ten and twelve years we met in his house every Friday evening between eight and ten o'clock. Our time was almost exclusively taken up in examining and testing object-glasses. Very often, indeed, I may say always, when he had acquired a new glass, I got it home with me to experiment with on my own microscope. For myself, in addition, I was acquainted with Mr. A. Henderson, who dealt largely in Hartnack, afterwards Prasmowski, and Nachet microscopes, while Professor Goodsir was alive, and he submitted to me almost every set of these on their arrival.

The result of our means of testing was this: We could resolve easily such diatoms as *Navicula cuspidata* in balsam, an easy test when dry for a good quarter, but a rather difficult one in balsam. The large Bennis Lake *Rhomboides* in balsam, one of the most beautiful of all the diatoms when mounted in this way. The small *Rhomboides* dry we could do easily, and so also *Amphipleura Lindheimerii*. *Gemma* we could see pretty well, but not with the crispness of a modern glass.

There were, however, a few which we failed to see. These were *P. macrum*, *Stauroneis spicula*, *Navicula crassinervis*, *Frustulia saxonica* of Rabenhorst, and *Amphipleura pellucida*.

When, however, the vertical illuminator was devised by an American microscopist,[1] and a specimen of it got from Beck,

1. [Professor H. L. Smith. Ed.]

our difficulties in seeing the striæ on these diatoms soon disappeared. The instrument was and is, however, one rather difficult to manage. Various forms of it have been made. As first constructed it consisted simply of a means of placing a round cover-glass opposite an aperture in the side of a fitting above the object-glass at an angle of 45°, while the lamp was placed on the left-hand side of the microscope. Powell & Lealand's form was different. They fixed in the fitting at an angle of 45° a small piece of glass, ground to a perfect plane on both sides. The glass was rigidly fixed in the fitting, and the light was adjusted by moving the lamp. Quite recently I have noticed that a vertical illuminator has been devised in France by placing a perforated silvered mirror in the body of the microscope itself to throw down the light; while Professor Abbé does the same thing by means of a small right-angle prism immediately above the object-glass.

In all these forms the action is precisely the same. The light is thrown down through the object-glass. The object-glass becomes its own condenser.

The difficulties connected with the use of the instrument are not a few.

In the first place, the object *must* be mounted dry on the cover-glass, and adhering to its under surface. This is a very simple and easy thing to do, and is the proper way to mount all the finer sorts of diatoms. Second, the edge of the lamp-flame must be used. All light should be cut off except the small portion projected upon the diatom under examination. When I first began the use of the vertical illuminator I was accustomed to place my pointer finger of the left hand half way over the side aperture of the fitting, and thus shut off the illumination of one-half of the cover-glass, and in this way vastly improve the illumination. Third, in the use of this apparatus we have always too much light. Dr. Steinheil has stated that unsilvered glass reflects only 5% of the light falling upon it; but Mr. Edwin Holmes recently made some experiments of the same kind, and he reduces the percentage to 3. It will be seen from these figures that there must be a great difference between the cover-glass reflector and Professor

Abbé's prism. It is, however, easy to modify and reduce the light when the prism is used. I found that, by placing the lamp at an increased distance away, any reduction can be got. About eighteen inches does very well. Fourth, you will see that Abbé's prism only covers one-half of the aperture, and thus the light transmitted by the other half of the object-glass reaches the eye-piece without interference, as in the case of the cover-glass. It thus acts in the same way as the cover-glass does when it is restricted by a diaphragm or one's finger, with this essential difference, that in the case of the cover-glass the light has to pass through it on its return journey before reaching the eye-piece.

I had not opened the box of my Beck Vertical Illuminator for many years until I saw that Abbé had devised and made this one. I spent a little time in examining the two, and comparing the effect of each. I saw that by a little modification I could materially improve the cover-glass one. I did this by cutting the cover-glass in two, and placing only one-half in the holder. I blackened the back of it. In this way I used only the half of the cover-glass for reflection, and the light was free to return through the other unoccupied half, straight to the eye-piece. When this is done we get sufficient light for all purposes; and I even prefer it to the prism, where we have too much. Only one thing more requires to be mentioned. We can use only shallow eye-pieces with the vertical illuminator. I find it impossible to magnify the object-glass image by deep eye-pieces.

The late S. G. O. of the *Times* (Lord Sidney Godolphin Osborne) devised an illuminator, which he termed a Diatomscope. The vertical illuminator might very well receive the same name. I am not aware that it ever was, or ever can be, used on any other objects than diatoms[2]. It received its first blow when Mr. Wenham devised his Reflex Illuminator, a much superior instrument for resolving diatoms, as, by its means, the light being projected from beneath, one can mag-

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2. [Professor H. L. Smith's Vertical Illuminator has been exhibited on several occasions before the New York Microscopical Society by Mr. Charles S. Shultz, giving fine effect when viewing Professor Rogers's rulings on speculum metal. Ed.]

nify the image by eye-pieces to any reasonable extent. Another thing which has set the vertical illuminator aside is the invention by Mr. J. W. Stephenson of oil immersion objectives No one would ever think of wasting time with the vertical illuminator when the same end can be so easily obtained without its aid.

I thought its office was long ago *functus*, and was not a little surprised to find it had been revived by Professor Abbé. In my recent experiments I came upon one very beautiful example of its use. I placed a slide by Möller of *P. angulatum* on the stage. In one of these you always find a few valves adhering to the cover glass, either wholly or partially. When using the vertical illuminator along with a No. 4 compensating eye-piece and an 8 mm. apochromatic, one sees a small portion of one of the valves very clearly and sharply shown where it is adhering to the cover, while the rest of it, where it gradually shades away from its adherence to the cover, shows the most beautifully minute series of Newton's rings.

EXAMINATION OF SUSPECTED DOCUMENTS.—Blarez, in an article on this subject, in the *Journal de Pharmacie*, recommends the use of two liquids with which he moistens the places on the documents at which it is suspected that a forgery has been committed. The first of these liquids consists of 1 part of castor oil dissolved in 6 parts of alcohol of 95%. This is painted on with a camel's hair pencil, the effect being to make the paper partially transparent, and thus to bring out traces of erased writing. The second solution consists of a 2% aqueous solution of caustic soda. The operation of this liquid depends upon the methods of the falsificator. As a general thing, the latter removes a single figure from a number. In order to bring back the horizontal line, a portion of which he must almost necessarily remove, and to repair any damage done to the surface by the process of scraping or shaving, he covers the spot with a coating of sandrac varnish. If the injury has been very considerable he repeats the operation on the opposite side of the paper. This varnish gives the paper back, to a large extent, restores the paper to its natural appearance, and, besides, gives it a surface upon which he can write or print without fear of the ink spreading. The figure put in the place of the one erased does not rest on the paper, however, but on the layer of varnish, and on this fact rests our ability to remove the counterfeit figure without interfering with the genuine ones that remain. An application of the second fluid effaces the printed figure. In this manner the writer has succeeded in demonstrating some of the cleverest forgeries.—*National Druggist*, XXVII. 371 (December, 1897).

PHOTOGRAPHS WITHOUT LIGHT.

In a recent paper, read by Dr. Russell before the Royal Society, he described the results of a series of experiments which, to photographers, almost rival the discovery of the X–rays. From time to time various experimenters have claimed to obtain photographs by the long exposure of bodies to sensitive photographic surfaces without the action of light. As far as we are aware, however, with the exception of Becquerel's and Colson's experiments, the precautions taken for the exclusion of extraneous light have not been such as to place these experiments above suspicion.

There now seems little room for doubt that many of the common substances with which we are surrounded have the property of emitting invisible active radiations, which can pass through many bodies that we have been in the habit of regarding as opaque. Becquerel some time ago showed that different compounds of uranium, if allowed to remain on a sensitive photographic plate for some days in the dark, had considerable action on the film, and if the plate was developed in the usual way, a photograph of the body was obtained.

Dr. Russell, in repeating Becqurel's experiments, has discovered that this particular action is by no means confined to uranium salts, but that many of the metals and other bodies, such as wood, charcoal, copal, straw, etc., possess it in a marked degree. The radiations from these bodies, however, differ in one very important particular from those given out by the uranium compounds. While the latter readily pass through glass, the former are completely stopped by it. Mr. Colson, in January last, described the action of zinc, cadmium and magnesium on photographic films in the dark. At the time of making his experiments Dr. Russell was not aware of this, and, consequently, his results are independently confirmed.

Starting with the metals mercury, zinc, magnesium, cadmium, nickel, aluminum, pewter, fusible metal, lead, bismuth, tin, cobalt and antimony, he found that all these, after a week's

exposure near a sensitive plate in the dark, produced a distinct effect upon the plate, while gold, iron and copper showed a very slight effect. The action is not in any way due to "contact phenomena," as a polished surface of zinc with a design scratched on it gave a distinct image of the markings when not touching the plate, and even when thin screens of gutta percha or celluloid were interposed between the sensitive plate and the zinc surface. Some metals were then coated with copal varnish, to see if this would interfere with the effect. It was found that the image was more rather than less distinct.

In another set of experiments, cardboard pill boxes were used for enclosing certain substances before allowing them to act upon the photographic plate. It was discovered that an empty box emitted active radiations, giving a most distinct image. This suggested experiments with different cardboards, when it was found that the better qualities were quite inactive, while the common varieties, known as straw-board, had considerable action on the plates. Among the other bodies experimented with were green and dry woods, both of which were active. A section from a young larch tree gave an excellent image, showing rings and layer of bark. Charcoal was also found to be active, but lost its activity if heated for several hours in a closed crucible.

The results obtained with printer's ink were very interesting. In many cases they produced no action at all, and in other cases they were remarkably active. The ink used by the *Westminster Gazette*, the *Standard*, and the *Daily Graphic* gave excellent pictures of the printing. The *Times* showed not quite such good results, while ink of the *Morning Post* and the *Echo* had no action at all.

What is this mysterious force? Its nature has still to be discovered. Two points seem to have been established. The first is that an increase of the temperature of the body greatly increases its activity; the second, that aqueous vapor in no way assists the action. Bodies which, at 0° C. had no action whatever, at 70° C. gave distinct images. It has further been suggested that the chemical action is caused by a finely attenuated vapor given out by the different metals and other bodies.

It it far more likely to be due to some hidden form of energy more or less akin to what has been paradoxically, but suggestively, called dark light. *Journ. Franklin Institute*, CXLIV. 392 (Nov., 1897).

A Limpid Colorless Solution of Copal.—"Immersion" writes to the editor to know if there is any way to procure an absolutely limpid and colorless solution of copal, adding, that if such can by any means be obtained it will prove a boon to microscopical workers. He can obtain the "boon" by proceeding as follows :

Dissolve 1 part of gum camphor in 12 parts of sulphuric ether, and to the solution add 4 parts of gum copal. Carefully close the flask, and set aside, with occasional agitations, until the copal is partly dissolved and partly swollen to its fullest extent, then add 4 parts of absolute alcohol and one-fourth of a part of rectified turpentine oil, and agitate well. Set aside, giving an occasional agitation, for several days, and at the end of a week the contents of the flask will be found separated into two layers, a crystal clear, colorless stratum of copal in solution, floating on a dark, thick layer, which contains all the coloring matter, dirt, etc., of the gum. Decant, or syphon off, the upper layer and treat the residue with more alcohol and oil of turpentine in the same relative proportions, agitate as before, and let rest, when another stratum of clear solution will be obtained. Syphon off or decant, and mix the two clear portions of liquid. If the solution be too thin for the purposes for which the same is desired, it can easily be thickened by allowing a portion of the solvent to evaporate. The liquid can be rendered a slower dryer by the addition of a small amount of Canada balsam.—*National Druggist*, XXVII. 371 (December, 1897).

PUBLICATIONS RECEIVED.

American Monthly Microscopical Journal: Vol. XVIII., Nos. 3–10 (March–October, 1897).

The Microscope: Vol. V., Nos. 3–10 (March–October, 1897).

Bulletin of the Torrey Botanical Club: Vol. XXIV., Nos. 4–9 (April–September, 1897).

Anthony's Photographic Bulletin: Vol. XXVIII., Nos. 6–10 (June–October, 1897).

The Observer: Vol. VIII., Nos. 1–5 (January–May, 1897).

Natural Science Association of Staten Island. Proceedings: Vol. VI., Nos. 6–9 (April–September, 1897).

School of Mines Quarterly: Vol. XVIII., No. 3 (April, 1897).

American Academy of Arts and Sciences. Proceedings: Vol. XXXII., No. 10—Vol. XXXIII., No. 4 (March–August, 1897).

Public Library of Boston. Annual Report (1896).

Museum of Comparative Zoölogy. Bulletin: Vol. XXX., Nos. 4–6 (February–April, 1897).

Boston Society of Natural History. Proceedings: Vol. XXVIII., Nos. 1–5 (April–August, 1897).

Academy of Natural Sciences of Philadelphia. Proceedings: Part 1 (January–March, 1897).

Journal of the Franklin Institute: Vol. CXLIII., No. 856—Vol. CXLIV., No. 862 (April–October, 1897).

Bulletin of the Essex Institute: Vol. XXVII., No. 7—Vol. XXIX., No. 6 (July, 1895–June, 1897).

Massachusetts Horticultural Society. Transactions (1897).

Field Columbian Museum. Zoölogical Series, Nos. 19, 20; Geologica Series, No. 18 (1897).

Academy of Science of St. Louis. Transactions: Vol. VII., Nos. 10–15 (November, 1896–June, 1897).

Missouri Botanical Garden. Eighth Report (1897).

Chicago Academy of Sciences. The Pleistocene Features and Deposits of the Chicago Area (May, 1897).

Portland Society of Natural History. Proceedings: Vol. II., Part 4 (1897).

Minnesota Botanical Studies. Bulletin No. 9. Parts 10, 11 (May, 1897).

Colorado Scientific Society. Nature of Chemical Elements; Argon and Helium in the Periodic Sequeme; The Oscuro Mountain Meteorite; A Recent Assay Balance; Ferric Sulphate in Mine Waters (1897).

Elisha Mitchell Scientific Society. Journal: Vol. XIII., Nos. 1, 2 (1896).

California Academy of Sciences. Proceedings: Botany, Vol. I., No. 1 (June, 1897). Zoölogy, Vol. I., Nos. 1–4 (April–July, 1897). Occasional Papers, Reptiles of the Pacific Coast (Sep., 1897).

Alabama Agricultural Experiment Station. Bulletins: Nos. 79–87 (March–August, 1897).

Cornell University Agricultural Experiment Station. Bulletins: Nos. 127–137 (February–May, 1897).

Michigan Agricultural College Experiment Station. Bulletins: Nos. 141–144 (February–April, 1897).

Letters to Ruth. By Mrs. Lucy Bronson Dudley (1897).

Actinomycosis. By Parker Syms, M.D. (February, 1897).

New York State Museum. Report 48 (1894).

American Museum of Natural History. Report (1896).

Oberlin College. Laboratory Bulletins: Nos. 6, 7 (1897).

The Brooklyn Medical Journal: Vol. XI., Nos. 5–10 (May–October, 1897).

Pacific Medical Journal: Vol. XL., Nos. 4–10 (April–October, 1897).

National Druggist: Vol. XXVII., Nos. 4–10 (April–October, 1897).

Meyer Brothers' Druggist: Vol. XVIII., Nos. 4–10 (April–October, 1897).

Johns Hopkins University Circulars: Vol. XVI., Nos. 130, 131 (June, July, 1897).

Journal of the Royal Microscopical Society: 1897, Part 2.

Journal of the Quekett Microscopical Club: Vol. VI., No. 40 (April, 1897).

International Journal of Microscopy and Natural Science: Vol. VII., Nos. 34, 35 (April, July, 1897).

Manchester Microscopical Society, Transactions and Annual Report (1896).

Scottish Microscopical Society, Proceedings: Vol. II., No. 1 (1896).

Natural History Society of Glasgow, Transactions: Vol. IV., Part 3 (1896).

The Naturalist: Nos. 261–267 (April–October, 1897).

Geological Survey of Canada, Annual Report: Vol. VIII. (1895).

The Canadian Institute, Proceedings: Vol. I., Nos. 1, 2 (February, May, 1897). Transactions: Vol. V., No. 9 (October, 1897).

Canadian Record of Science: Vol. VII., No. 4 (1897).

Natural History Society of New Brunswick, Bulletin: No. 15 (1897).

Hamilton Association, Journal and Proceedings (1897).

Nova Scotian Institute of Science, Proceedings and Transactions: Vol. IX., No. 2 (October, 1896).

The Ottawa Naturalist: Vol. X., No. 12—Vol. XI., No. 4 (March–July, 1897).

Royal Society of New South Wales, Journal and Proceedings: Vol. XXX. (1896).

The Victorian Naturalist: Vol. XIII., No. 11—Vol. XIV., No. 5 (February–September, 1897).

The Australian Museum, Annual Report (1896). Records: Vol. III., No. 2 (August, 1897).

Société Belge de Microscopie, Annales: Vol. XXI. (1897). Bulletin: Vol. XXIII., Nos. 4–6 (January–March, 1897).

Le Micrographe Préparateur: Vol. V., Nos. 1–5 (January–October, 1897).

La Feuille des Jeunes Naturalistes: Vol. XXVII., Nos. 318–324 (April–October, 1897).

Société les Amis des Sciences et Arts, Bulletin: Vol. VI., Nos. 4–6 (1896).

Société Helvétique des Sciences Naturelles, Actes: Session 78 (September, 1895); Session 79 (April, 1896). Compte Rendu a Zermatt (1895), a Zurich (1896).

Société d'Études Scientifiques d'Angers, Bulletin: Vol. XXV. (1896).

Société Royale de Botanique de Belgique, Bulletin: Vol. XXXV., No. 2 (1896); Vol. XXXVI., No. 1 (1897).

Naturwissenschaftlicher Verein zu Osnabrück. Jahrsbericht: (1895, 1896).

Gesellschaft zu Beforderung der gesampten Naturwissenschaften zu Marburg. Sitzungsberichte (1896).

Nassausicher Verein für Naturkunde. Jahrbuch: Vol. L. (1897).

L'Académie Royale des Sciences à Stockholm, Memoires: Vol. XXI., Sections 3, 4 (1896).

Naturwissenschaftlicher Verein, Frankfurt a O., Helios: Vol. XIV. (1897). Societatum Litteræ: Vol. X., No. 7—Vol. XI., No. 6 (July, 1896–June, 1897).

Wissenschaftlicher Club in Wien. Monatsblätter: Vol. XVIII., Nos. 6–12 (March–September, 1897).

Accademia di Scienze, Lettere e Arti di Acireale, Proceedings: Vol. VII. (1896).

Nuovo Giornale Botanico Italiano: Vol. IV., Nos. 2, 3 (April, July, 1897).

Bullettino della Società Botanica Italiana: 1897, Nos. 2–4.

La Nuova Notarisia: Vol. VIII. (April, July, 1897).

Bollettino della Società Africana d'Italia: Vol. XII., No. 7—Vol. XIII., No. 12 (July, 1893–December, 1894).

Société Imperiale des Naturalistes de Moscou, Bulletin: 1896, Nos. 2, 3.

Société des Naturalistes de Kiew, Mémoires: Vol. XV., Nos. 1, 2 (1896, 1897).

L'Académie d'Hippone, Bulletin: No. 28 (1896).

Sociedad Cientifica "Antonio Alzate," Memorias: Vol. X., Nos. 1–4 (1896, 1897).

Museo Nacional de Montevideo, Anales: No. 6 (1897).

Instituto de Hijiene de Santiago, Revista: Vol. III., No. 10 (February, 1896).

Société Scientifique du Chili, Actes: Vol. V., No. 5—Vol. VII., No. 1 (December, 1895–July, 1897).

Museo de la Plata, Revista: Vol. VII., No. 2 (1896). Anthropologie des Anciens Habitants de la Région Calchaquie (1896).

Ksl. Leop.-Carol. Akademie der Naturforscher. Nova Acta: Vol. LXI., No. 2 (1893); Vol. LXII., No. 3 (1894); Vol. XLVI., No. 3 (1896).

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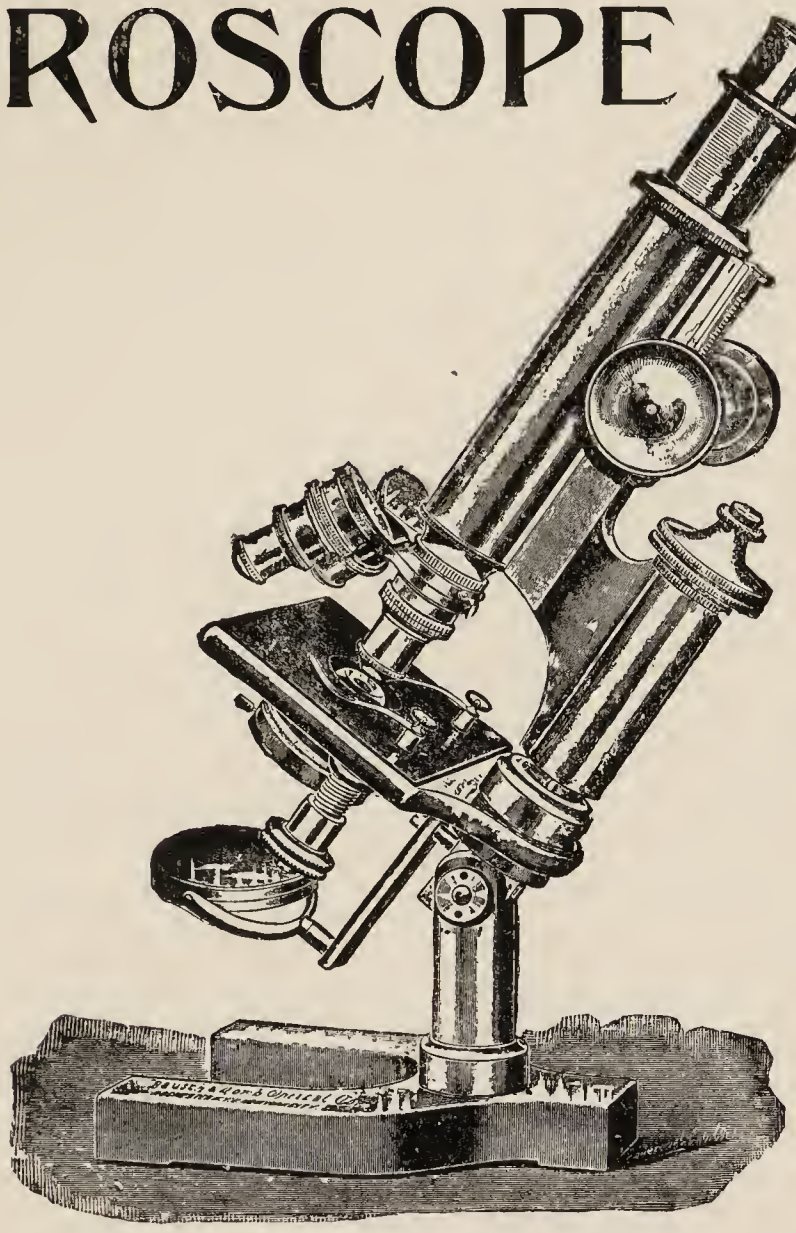

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